

REMARKS

Claims 1-37 are all the claims pending in the application, stand rejected on prior art grounds. Applicants respectfully traverse the rejections based on the following discussion.

I. The Claim Rejections

Claims 1-5, 7-18, 20, 24-27 and 37 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Mirkin (U.S. Patent Publication No. 2002/0131843), in view of Mirkin (U.S. Publication No. 2002/0063212). Claims 6, 19, 21-23 and 28-29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Mirkin (843) and Mirkin (212), in further view of Colbert (U.S. Publication No. 2003/0106998). Claims 30-36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Mirkin (843), Mirkin (212) and Colbert, in further view of Requicha (U.S. Patent No. 6,508,979).

A. The Rejection Based on Mirkin (843) in View of Mirkin (212)

Regarding independent claim 1 and similarly, independent claims 10, 24-27 and 37, and dependent claims 2-5, 7-9, 11-18 and 20, first, the references, separately, or in combination, fail to disclose, teach or suggest a reason or motivation for being combined.

Second, even assuming that the references would have been legally combinable, Mirkin (843) does not disclose, teach or suggest the features of independent claim 1, and similarly independent claims 10, 24-27 and 37, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle. (See Page 7, line 20-Page 8, line 2; Page 9, lines 19-20; and Figures 2(b)-2(g)).

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Indeed, Applicants agree with the Examiner that Mirkin (843) “fails to teach the attachment of a single nanoparticle or single nanoparticle layer.” Applicants further agree with the Examiner that Mirkin (843) does not disclose “having a specific value of length vs. width that is less than 15%.” Accordingly, Mirkin (843) is deficient in that it does not disclose Applicants’ claimed invention. (See Office Action, Page 3, 2nd and 3rd Paragraphs).

Indeed, Mirkin (843) merely discloses a method of nanolithography utilizing a scanning probe microscope tip to pattern a substrate passivated with a resist using a patterning compound. Contrary to the assertion in the Office Action, the patterning compound is a molecular compound transferred to a substrate, not a nanoparticle permanently adhered to a scanning probe microscope tip. Accordingly, Mirkin (843) is structurally and functionally distinct and not equivalent to the claimed invention. (See Mirkin at Abstract; and Paragraphs [0001] and [0006]).

Applicants respectfully submit that the Examiner misinterprets Mirkin (843) in the Office Action. Although the Office Action cites paragraphs [0015], [0053], and [0093] as evidence of Applicants’ claimed invention, none of these paragraphs, or for that matter any other paragraph in Mirkin (843), appear to discuss any “nanoparticle containing additives.” Instead, Mirkin (843) discusses many different possible patterning compounds, however these patterning compounds are all different types of molecules; not nanoparticles as claimed by Applicant. (See Office Action, Page 2-3, Section 3; and Mirkin (843). Paragraphs [0055]-[0074]).

Indeed, Mirkin (843) does not disclose a method for “coating a probe tip with a patterning compound.” Instead, Mirkin (843) specifically describes: “The method comprising...coating the tip with a solution of the patterning compound, and contacting the coated tip with the substrate so that the compound is applied to the substrate so as to produce a

desired pattern.” Accordingly, it is clear that the patterning compound is never applied to the tip as the patterning compound remains in solution when coating the tip. Further, Mirkin (843) teaches away from having the patterning compound coating the tip as Mirkin (843) is focused on transferring the patterning compound to the substrate. Thus, the Mirkin (843) structure is directly counter to Applicants' invention, in which nanoparticles are adhered permanently to the tip. (See Mirkin [0015]).

In addition, Applicants traverse the assertion that Mirkin (843) discloses or teaches “a variety of patterning compounds that include nanoparticles.” Instead, as noted above, paragraphs [0055]-[0074] disclose a long list of possible patterning compounds, which are all molecular compounds, not nanoparticles. In particular, paragraph [0081] describes a method by which force can be applied between tip and sample – in this case, a method for applying a magnetic force. Mirkin (843) states that this can be done “with a magnetic material located behind the tip by a current-carrying coil.” However, there is no disclosure or suggestion of nanoparticles in relation to this method, or in fact of anything attached to a tip. Further, paragraph [0089] describes patterning of arrays with arrays of biological materials. Again, Mirkin (843) does not disclose or suggest any nanoparticles in this paragraph or in any paragraph. Furthermore, this paragraph does not disclose attaching anything to a tip. (See Mirkin (843), Paragraphs [0055]-[0074], [0081], and [0089]).

Please note, although Mirkin (843) appears to describe the use of 13 and 20nm nanoparticles, Mirkin's use of these nanoparticles is structurally unrelated to Applicants' invention as these nanoparticles are attached to the substrate, whereas Applicants disclose that the nanoparticles are permanently adhered to the tip.

In particular, paragraph [0109] describes “a structure-forming compound comprising oligonucleotide strand B attached to 13nm nanoparticles was applied as described above.” Paragraph [0105] describes a “Structure-forming compound B was applied to the substrate by immersing the substrate in a solution of the compound for an hour at room temperature so that the oligonucleotide strand B hybridized to oligonucleotide C.” However, as indicated above, these disclosures involve attaching the 13nm nanoparticles (with oligonucleotide strand B attached) to the substrate, and not to a tip. Indeed, the essence of Mirkin’s invention is that structures are attached to substrates, and not the tips used to pattern the substrates. Similarly, paragraph [0114] is a different example involving 20nm gold nanoparticles, however again these nanoparticles are affixed to oligonucleotide strand D and then attached to a substrate, and not a tip. [0114] notes “oligonucleotide strand D attached to 20nm gold nanoparticles was prepared and applied to the substrate as described in Example 1....”

Accordingly, Mirkin (843) does not teach nanoparticles permanently adhered to a tip, let alone, an outer coating layer of a nanoparticle. Therefore, Mirkin (843) does not disclose, teach or suggest, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle

Mirkin (212) is also deficient.

In contrast, Figures 27A and 27B of Mirkin (212) merely disclose “dip pen” lithography using a scanning probe microscope where a tip is coated with a patterning compound comprised of molecular compounds and delivered from the tip to a substrate. Although Mirkin (212) is primarily focused on using molecular compounds as a patterning compound, Mirkin (212) does suggest a single particle array formed on 300nm or 700 nm dots. However, Mirkin (212) like Mirkin (843) discloses that the patterning compound is easily removable from the tip surface

with a suitable solvent, and thus is not permanently adhered to the tip like Applicants' invention. (See Office Action, Page 3, Paragraph 3; Mirkin (212) at Abstract; Page 4, Paragraphs [0049] and [0054]; Page 24, Paragraph [0209]; and Figures 27A and 27B).

Indeed, Mirkin (212) appears to suggest coating a tip of the scanning probe microscope, not a coating over each single particle of the array. Therefore, Mirkin (212) does not disclose, teach or suggest, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle as claimed by Applicants.

In comparison, Applicants' invention includes a scanning probe microscope tip 1 where nanoparticles 2 are permanently adhered to the scanning probe microscope tip 1, and each nanoparticle is encapsulated by an outer coating layer 3. The nanoparticles 2, for example, as recited in claim 31, may include cobalt nanoparticles. Further, the outer coating layer 3, for example, as recited in claim 32, may include a single molecular layer of oleic acid. (See Application, Page 7, line 20-Page 8, line 1).

As discussed above, Mirkin (843) only discloses molecular compounds and Mirkin (212) primarily discloses molecular compounds and suggests single particles as patterning compounds, though neither reference discloses or suggests any outer coating layer encapsulating the molecular compounds or the single particles. Accordingly, the claimed invention provides a structure, which improves the spatial resolution of a scanning probe microscope when compared with either of the conventional Mirkin inventions.

Thus, Applicants traverse the assertion that Mirkin (843) and Mirkin (212) teach Applicants' invention.

For at least the reasons outlined above, Applicants respectfully submit that neither Mirkin (843) nor Mirkin (212), alone or in combination, disclose, teach or suggest, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle.

For the reasons stated above, the claimed invention, and the invention as cited in independent claim 1, and similarly, independent claims 10, 24-27 and 37, and related dependent claims 2-5, 7-9, 11-18 and 204, are fully patentable over the cited references.

B. The Rejection Based on Mirkin (843) in View of Mirkin (212), and further in view of Colbert

First, at least three (3) references have been "combined" in an attempt to disclose Applicants' claimed invention, which is evidence of non-obviousness.

Regarding independent claim 1 and similarly, independent claim 28, and related dependent claims 6, 19, 21-23 and 29, first, the references, separately, or in combination, fail to disclose, teach or suggest a reason or motivation for being combined.

Second, even assuming that the references would have been legally combinable, neither Mirkin (843) nor Mirkin (212), as discussed above, disclose, teach or suggest the features of independent claim 1, and similarly independent claim 28, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle. (See above).

Indeed, the Applicants agree with the Examiner that neither Mirkin (843) nor Mirkin (212), disclose the use of adhesion layers and annealing, as well as the above claimed feature, and thus these references are deficient in that they do not disclose Applicants' claimed invention. (See Office Action, Page 4, lines 1-9).

Colbert is also deficient.

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In contrast, Colbert merely discloses macroscopically manipulable nanoscale devices made from nanotube assemblies. As described in highly specific detail in the previous Amendment, Applicants clearly describe that Colbert is focused on using molecular nanotubes to fabricate devices that enable interaction between macroscopic systems and individual objects having nanometer dimension without disclosing or suggesting the use of nanoparticles like Applicants' claimed invention.

For emphasis, as indicated in Colbert, "in a preferred form this device comprises a nanotube probe tip assembly made up of one or more single-wall and/or multi-wall nanotubes." Accordingly, Colbert teaches away from using the smaller nanoparticles. Indeed, Applicants agree with the Examiner that Colbert as well as Mirkin (843) and Mirkin (212) fail to teach the use of spherical nanoparticles. Clearly, Colbert does not disclose or teach the use of any nanoparticles, let alone, spherical nanoparticles or a coating encapsulating nanoparticles. Therefore, Colbert does not teach or suggest including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle. (See Office Action, Page 4, Section 5; Colbert at Abstract; Page 1, Paragraph [0007], [0012]; and Page 2, Paragraph [0034]; and Page 10, Paragraph [0115]).

Applicants' invention, as discussed above, includes nanoparticles 2 encapsulated with an outer coating layer 3, whereas Colbert only discloses nanotubes, not nanoparticles, let alone, nanoparticles encapsulated with an outer coating layer. Thus, Applicants traverse the assertion that Colbert teaches Applicants' invention.

For at least the reasons outlined above, Applicants respectfully submit that none of Mirkin (843), Mirkin (212) nor Colbert, alone or in combination, disclose, teach or suggest, including each of the nanoparticles includes an outer coating layer encapsulating each

nanoparticle.

For the reasons stated above, the claimed invention, and the invention as cited in independent claim 1 and similarly, independent claim 28, and related dependent claims 6, 19, 21-23 and 29, is fully patentable over the cited references.

C. The Rejection Based on Mirkin (843), Mirkin (212), and Colbert, in view of Requicha

First, at least four (4) references have been "combined" in an attempt to disclose Applicant's claimed invention. This is evidence of non-obviousness.

Regarding independent claim 1 and similarly, independent claims 10 and 24-28, and related dependent claims 30-36, first, the references, separately, or in combination, fail to disclose, teach or suggest a reason or motivation for being combined.

Second, even assuming that the references would have been legally combinable, none of Mirkin (843), Mirkin (212), nor Colbert, as discussed above, disclose, teach or suggest the features of independent claim 1, and similarly independent claims 10 and 24-28, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle. (See above).

Indeed, the Applicants agree with the Examiner that none of Mirkin (843), Mirkin (212), nor Colbert "teach the use of spherical nanoparticles," as claimed, for example, in claims 30-36, and thus these references are deficient in that they do not disclose Applicant's claimed invention. (See Office Action, Page 4, Section 5, Paragraph 2).

Requicha is also deficient.

In contrast, Figures 2A-2F of Requicha merely disclose a method, and related structure, for fabricating a nanoscale object including defining a sequence of nanolayers that represent the nanoscale object, constructing a current nanolayer on a first surface, and depositing a sacrificial layer to cover the first surface but not the nanolayer. As described in highly specific detail in the previous Amendment, and in response to the assertions in this Office Action, Applicants clearly assert that Requicha is focused on using nanolayers where the nanolayers may be comprised of gold spherical nanoparticles with diameters between 5 and 30 nm. Although, Requicha discloses gold nanoparticles, the gold nanoparticles are cross linked to form the nanolayers, and thus the resultant structure are nanolayers, not individual nanoparticles permanently adhered to a tip of a scanning probe microscope like the claimed invention. Accordingly, Requicha teaches away from forming structures with individual nanoparticles.

Indeed, Requicha may teach using nanoparticles as intermediate structures to form nanolayers, but does not disclose or teach the use of nanoparticles as the resultant structure, let alone, nanoparticles where each nanoparticle is encapsulated by an outer coating layer. Therefore, Requicha does not teach or suggest including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle. (See Office Action, Page 4, Section 5; Requicha at Abstract; Column 1, lines 10-25; Column 2, lines 30-50; Column 3, lines 35-47; and Figures 2A-2F).

For emphasis, Applicants' invention, as discussed above, includes nanoparticles 2 encapsulated with an outer coating layer 3, whereas Requicha only discloses nanolayers formed from nanoparticles. Since Requicha is deficient, Requicha also does not disclose or teach that the nanoparticles comprise cobalt nanoparticles, for example, as recited in claim 31.

For at least the reasons outlined above, Applicants respectfully submit that none of Mirkin (843), Mirkin (212), Colbert nor Requicha, alone or in combination, disclose, teach or suggest, including each of the nanoparticles includes an outer coating layer encapsulating each nanoparticle.

For the reasons stated above, the claimed invention, and the invention as cited in independent claim 1 and similarly, independent claims 10 and 24-28, and related dependent claims 30-36 is fully patentable over the cited references.

II. Formal Matters and Conclusion

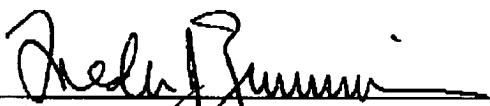
In view of the foregoing, the Applicants submit that claims 1-37, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Furthermore, no new matter is presented. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary. Please charge any deficiencies and credit any overpayments to Attorney's Deposit Account Number 50-0510.

Respectfully submitted,

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